spud-bar (an iron implement shaped like a crow-bar, with a chisel-blade at one end, for digging) with one blow I cut its head squarely off. The body was taken back to camp. This was about 5 P.M.

About eight o'clock that evening, wishing to skin the snake, I placed the body upon my desk, noting as I did so that there was the slightest movement of the body. I took a scalpel, and holding the tail in one hand, started to cut off the rattles. The snake had no sooner been touched by the blade of the scalpel than it snatched its tail away, rattled viciously, and struck at my hand with its headless neck three times. I postponed the skinning until a later time.

The snake was a small one, being about eighteen inches in length, with five rattles. It was killed at an elevation of about 1,150 feet.

Some weeks later I found another of the same species stuck fast in a pool of the crude oil with which the Santa Fe track is sprinkled. Large numbers of small animals, especially mice, lose their lives in this manner. In places the track is nearly covered with the remnants of dead bodies.

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May 30, 1909

QUOTATIONS

A LONGEVITY TRUST

THE term "life insurance" never meant the insuring of lives until this year, when Dr. Burnside Foster and Professor Irving Fisher interested the life companies in their plans of preventing premature death. One company has this week announced its purpose to save one third of the amount awarded for death claims of tuberculous policy holders by a campaign of cure and prevention. The agents of the companies might easily be transformed into a militant body of health agents, armed with pamphlets and advice to each holder of the millions of policies. A staff of visiting physicians, specialists in the chief diseases, may treat patients in every community who can not otherwise command skilled services. By such work the companies would have fewer death claims to pay. They could promise larger benefits. But this, which has hitherto been a deciding argument in insurance competition, is only incidental to the added promise that the policy holder's life, which is of quite inestimable value to his family, would be guarded.

The competition of the life companies, once started toward the prolongation of their patrons' lives, will not end until not only tuberculosis but all the diseases that figure largely in the actuarial tables become the subject of skilled attention. The lives of most men who can afford to employ a doctor are already "insured." Ultimately, we presume, those physicians not retained by the companies would be reduced to treating minor ills, or they would be forced quite out of their profession.

The organization of preventive medicine has reached startling proportions, but it has failed to keep pace with the progress in medical science. This progress is so rapid that the medical colleges complain that they can not catch up in their equipment. But if the new departure in life insurance means anything, it means that the companies are beginning to resolve themselves into what they have an inherent right to be, companies of physicians—a longevity trust.—The New York *Times*.

SCIENTIFIC BOOKS

GAUDRY ON PYROTHERIUM [1]

THE venerated author of "Les Enchaînements du Monde Animal" was engaged until within a few days of his death upon a series of monographs dealing with the fossil mammalian faunæ of Patagonia and based upon specimens collected for the Paris Museum by M. André Tournouër.

The first of these monographs[2] dealt with

[1] "Fossiles de Patagonie: le *Pyrotherium*," *Ann. de Paléontologie* (Boule), tome IV., 1909, pp. 1–28, pll. I.–VII.

[2] "Fossiles de Patagonie—Dentition de quelques Mammifères," *Mem. de la Soc. géol. de France, Paléontologie*, Mem. XXXI., 1906, 4° (42 text figures).

the dentition of the extinct Patagonian "ungulates" and edentates, and showed in how many instances they exhibit strong but entirely homoplastic resemblances in the dentition to mammals of the northern hemisphere. The second memoir[3] made similar comparisons with respect to the limbs and endeavored to determine the pose of some of these anomalous creatures. The third[4] showed that all the fossil mammals of Patagonia (at least those from the older formations) belonged to peculiar southern groups which had followed their own lines of evolution independently of the mammals of the rest of the world. The fourth[5] memoir developed the idea of economy in nature. It showed that although the Patagonian groups had, as stated, followed their own lines of evolution, yet in many cases they had made the same structural responses to changing habits and conditions as had the northern forms, the principal difference being that the characters were never associated in exactly the same combinations in northern and southern groups. M. Gaudry concludes from this that it is unnecessary "to admit two centers of creation," *i. e.*, that more probably both northern and southern groups originally had a common center of distribution. The same memoir contained a discussion of the sequence and probable time equivalents of the principal mammal-bearing horizons of South America.

The memoir on *Pyrotherium*, which has recently appeared as a posthumous publication, was intended to be the first of a series on *Astrapotherium*, *Colpodon* and other important genera which the aged but no less productive author had hoped to describe before his death.

Pyrotherium is not the least puzzling of these curious forms. Its upper and lower cheek teeth are of the bilophodont type, that is, with two straight cross crests, and they are at first sight so much like those of the Miocene proboscidean *Dinotherium* of Europe that Dr. Fl. Ameghino, the original describer of *Pyrotherium*, has regarded it as an ancestral proboscidean. It has also a single pair of procumbent lower incisor tusks which grew continuously and had the enamel band confined to the anterior surface, as in rodents and early proboscideans, while the manus ascribed to it by Ameghino, but later declared by M. Tournouër to belong to *Astrapotherium*, certainly resembles in most characters the proboscidean type.

Fragmentary remains of the genus under consideration are characteristic of the so-called "*Pyrotherium* beds" of Chubut and Deseado. The age of these beds is very differently estimated by the leading authorities. Ameghino places them in the uppermost Cretaceous, but the majority of northern paleontologists, including M. Gaudry, are unwilling to concede that the *Pyrotherium* beds are older than the Middle or Upper Eocene.

M. Gaudry's material, although by far the most complete so far collected, still leaves us with a very imperfect knowledge of the skull and feet; but it includes specimens in an excellent state of preservation of the following parts: the upper and lower jaws, with the milk and permanent dentitions, the atlas, axis, a cervical vertebra, a lumbar, a caudal, the lower part of the scapula, and a part of the ilium, a sternal bone, and fore and hind limbs complete except for the manus and pes, which are represented only by a lunar, cuneiform carpi, astragalus and cuboid.

M. Gaudry's observations upon the special characters of *Pyrotherium* may be summarized briefly as follows: The dentition differs in important details from the proboscidean types (including *Mœritherium*): for instance, the mode of wear of the cheek teeth is entirely different, the premolars are different, the milk teeth are different, the section of the procumbent lower tusks shows no suggestion of the peculiar proboscidean "engine turning." The palate is very narrow, the orbit is placed above the fourth premolar. The atlas and axis differed widely from the proboscidean type, the

[3] *Idem*, "Les Attitudes de quelques animaux," *Ann. de Paléontologie*, t. I., 1906 (53 text figures).

[4] *Idem*, "Étude sur une portion du Monde antarctique," *ibid.*, t. I., 1906 (27 text figures).

[5] *Idem*, "De l'Economie dans la nature," *ibid.*, t. III., 1908 (71 text figures).

atlas not being pierced by the vertebral artery and having a prominent median hypapophysis, the odontoid of the axis being very large and short and supported on the enormous anterior border, while the neural tunnel in both bones is very circumscribed. The head was probably pointed downward and M. Gaudry ventures the hypothesis that the beast had the proportions of a gigantic cavy with bent fore limbs, but post-like hind limbs. A cervical vertebra is flattened, as in *Arsinoitherium* and the Proboscidea, but the lumbar vertebræ differ from the latter type. The most striking contrast with the Proboscidea lies in the forearm. The scapula has the spine turned forward instead of backward, the coracoid process is very long and prominent, the glenoid greatly extended. The massive humerus is extremely broad with very stout ento- and ecto-condylar and deltoid crests, large tuberosities and an enormous head. The radius and ulna are also very stout but absurdly short. M. Gaudry concludes from a study of the muscular attachments that the very powerful forearm may have been used in digging. The lunar and pyramidal (cuneiform) resemble those of *Elephas,* but are narrower. The acetabulum, as in the elephants, faced downward rather than outward. The straight hind limb had a long femur held almost in line with the tibia; the astragalus was greatly flattened and the navicular facet was directly below the tibial facet, and this indicates that the foot was strictly rectigrade, *i. e.,* with the digits in line with the tibia. To compensate for the relative immobility of the pes the knee joint could double up at a very sharp angle.

Upon this material M. Gaudry bases the important conclusion that *Pyrotherium* is not an ancestral proboscidean, and that all its resemblances to members of that order result from the assumption of bilophodont cheek teeth and post-like, rectigrade hind limbs; that these resemblances are accompanied by more numerous and fundamental differences, and that, in brief, *Pyrotherium* is not closely related to any other of the great "pachyderms" of different orders, such as *Astrapotherium, Dinoceros, Arsinoitherium, Brontotherium,* etc., and does not fit into any known order. This being the case, it seems rather unfortunate that M. Gaudry did not indicate by what name the new order containing *Pyrotherium* should be called.

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Righthandedness and Lefthandedness, with Chapters treating of the Writing Posture, the Rule of the Road, etc. By GEORGE M. GOULD, M.D. Pp. 210. Philadelphia and London, J. B. Lippincott Company. 1908.

Since the appearance in 1891 of Sir Daniel Wilson's "The Right Hand: Left-handedness," no volume, besides the present one, treating of that subject exclusively, has been published. Unlike Wilson's book, which treats rather of the archeological evidences of the origin, and the occurrence in primitive times, of left-handedness, Dr. Gould's monograph appears as the advocate of a new theory of right-handedness. In addition to this theory, according to which the predominant use of the right or left hand is determined by the dominance of the right or left eye, the pathological effects of faulty writing postures and the rules of the road, follow as corollaries to it. The theory which is by far the most interesting part of the book may be summarized in three propositions: (1) In all the higher animals in which a visual function is developed, purposive movements follow as a consequence of sight.

> To begin with, embryology demonstrates the existence of vision long before muscles, so that historically and evolutionally vision governs motility; the very cleavage of the brain in the two so independent halves of all types was doubtless due to the unilateralism and independence of ocular function (p. 45).

In animals whose eyes are placed so far laterad as to have no common field of vision, the right eye necessarily governs the movements of the right, and the left eye the movements of the left, limbs. In such animals, there is no necessity for the predominant use of one of the fore limbs; therefore, nothing analogous to right or left handedness is to be

found among them. But when a binocular field of regard has developed and objects which are placed directly in front of the animal may be seen, the preferred use, for all dexterous manual acts, of one hand over the other, becomes a necessity. What is it that determines that the right, rather than the left, hand is, as a matter of fact, preferred by some 94 per cent. of civilized men?

2. It is the eyeball. I have measured 20,000 or 30,000, and no one was perfect in shape. It is a poor and makeshift mechanism even apart from its morphology; . . . If now the right eye is the more defective, more ametropic, if its vision is poorer, more difficult, or more painful than that of the left, the left eye must be chosen to govern hand-action, and so, of course, the left hand will become habitually the more chosen, the more expert, and the more educated, for the special task, and soon the child is seen to be left-handed (p. 58).

That is to say, the hand on the side of the more perfect eye will be the hand preferred for skillful acts.

3. The centers of righteyedness, righthandedness, rightfootedness, speech and writing (with memory and intellect) must be topographically in the left cerebral hemisphere to insure speed, accuracy, and coordination of united sensation, thought, will and action (p. 55).

Whatever criticism may be passed upon certain aspects of the theory, the dependence of movement upon vision must be accepted as a fact. But, the ultimate reason for this dependence must not be lost sight of; the reason, namely, that the contraction of muscles is the final term in the sequence of events called the reflex act, of which the excitement of a sense organ is the first term. Sensation, therefore, in all conscious acts, must precede movement. From this standpoint the relation of vision to movement is not peculiar. The intimate connection between sight and action is due to the high development of the visual organ and the consequent importance of visual percepts in the mental life of the higher animals. But, that the right or left hand should come to be used exclusively for all highly specialized actions, as a consequence of the right or left eye being more nearly emmetropic than the other, seems to the reviewer to be untenable for several reasons. (1) In binocular vision it is impossible to distinguish the field of vision of one eye from that of the other. To all intents and purposes, the two eyes function as one. Even if the right eye, for example, were vastly worse than its mate, the right half of the field of vision would not be less clear than the opposite half. The whole field would suffer a uniformly distributed defect; but, unless some special test were made, the patient would be entirely ignorant of the fact that his right and not his left, eye was defective. With a uniformly dim, or a uniformly clear, field of vision where is there any motive in vision to the use of one, rather than the other, side of the body? (2) If, as the author seems to hold, the field of vision of each eye remains distinct from the other, even in binocular vision, and if each eye retains potential control of the muscles of the corresponding side of the body, it is difficult to see what has been the gain of binocular, over monocular, lateral, vision.

. . . it should be remembered that forward movement of a four-footed animal, composed of two poorly united or co-ordinated longitudinal halves, must be by means of the governors of all movement—vision. One organ of this vision was for the one badly coordinated half-body, the other for the opposite half. The brain was halved, also, but a slow and poor correlating mechanism was begun and is being improved, at present much improved. Even now the right eye is united in function with the right hand, the right foot, etc., and especially with language, the crowning achievement of humanization (p. 55).

(3) The author states that the center for "righteyedness" is in the left, and, by implication, the center for "lefteyedness" in the right, hemisphere of the brain. Now, as a matter of neurology, as, no doubt, the author is fully aware, the macular region of each retina is connected with both hemispheres, and it is only the corresponding peripheral regions of the retinas which are exclusively associated with one or the other hemisphere. Suppose, now, that the right eye of an infant of six months were normal and the left eye badly astigmatic. In accordance with our

author's theory, the better-seeing right eye would determine the use of the right hand (the center for the muscles of which is in the left hemisphere) in preference to the use of the left (the center for the muscles of which is in the right hemisphere). But, now, why should it? The macular region of the right retina is connected with the right hemisphere by just as short and pervious a neurone path, as with the left hemisphere. The associative neurones between the visual and motor centers of the right, are just as short and pervious as those of the left, hemisphere and, for objects situated in front of the infant, the left hand may be used as conveniently as the right. Under these circumstances, in which there are two possible paths with no advantage of one over the other, why should the nerve impulse traverse, as a matter of fact, one chain of neurones rather than the other? In the opinion of the reviewer, Dr. Gould's theory fails to answer this question. And it is only by answering this question that any theory of the dependence of motor asymmetry upon sight can hope to succeed.

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Colloids and the Ultramicroscope, A Manual of Colloid Chemistry and Ultramicroscopy. By RICHARD ZSIGMONDY. Authorized translation by JEROME ALEXANDER. Small 8vo, xii + 245 pages, illustrated. New York, John Wiley and Sons. Cloth, $3.00.

The study of colloidal solutions has justly received considerable attention in recent years. The appearance of the German edition of Professor Zsigmondy's book in 1905 was warmly welcomed, for besides being written in the admirable spirit of a careful student, it presented results obtained by means of a new apparatus, the ultramicroscope, which opened up a new method of attack of some of the perplexing problems of solutions.

The ultramicroscope, the chief feature of which is that by means of a special contrivance the sun's rays are concentrated so as to produce a very powerful light upon the material to be examined under a compound microscope, has enabled investigators to see minute particles hitherto invisible. Thus this instrument is of value not only in studying suspensions and colloidal solutions, but also in investigating all kinds of extremely finely divided material, and so the book is of greater significance than its title would indicate. Indeed, the results that have already been obtained by means of the ultramicroscope go far toward strengthening the probability of the atomic and molecular theories of matter.

The book is especially valuable in that it opens up new avenues of experimental investigation, and it is to be hoped that the methods of ultramicroscopy may be still further improved in the near future. During the interval between the appearance of the original and the translation, additional facts concerning colloids have been accumulated by means other than the ultramicroscope; these have not been considered. But it is to be remembered that the volume does not claim to be an exhaustive treatise on colloids.

To most chemists and physicists the work of Siedentopf and Zsigmondy is perhaps already familiar. It is to be hoped that this translation of the latter's book will be read by many others, particularly by those engaged in biology and applied chemistry. The book contains two colored plates not in the original, and also some minor additions to the text. The translator has done his work well; though a less rigid adherence to the letter of the original would have resulted in better idiomatic English. The book is printed upon good paper, the type used is excellent, and the cloth binding is neat, but the price is rather high.

LOUIS KAHLENBERG

SPECIAL ARTICLES

ANOTHER EXPLANATION OF THE HARDINESS OF GRIMM ALFALFA

IN the issue of SCIENCE for December 18, 1908, attention was called to certain points in connection with the history of Grimm alfalfa in Minnesota. In that article the well-known hardiness of this strain was attributed to acclimatization, subsequent to its introduction in